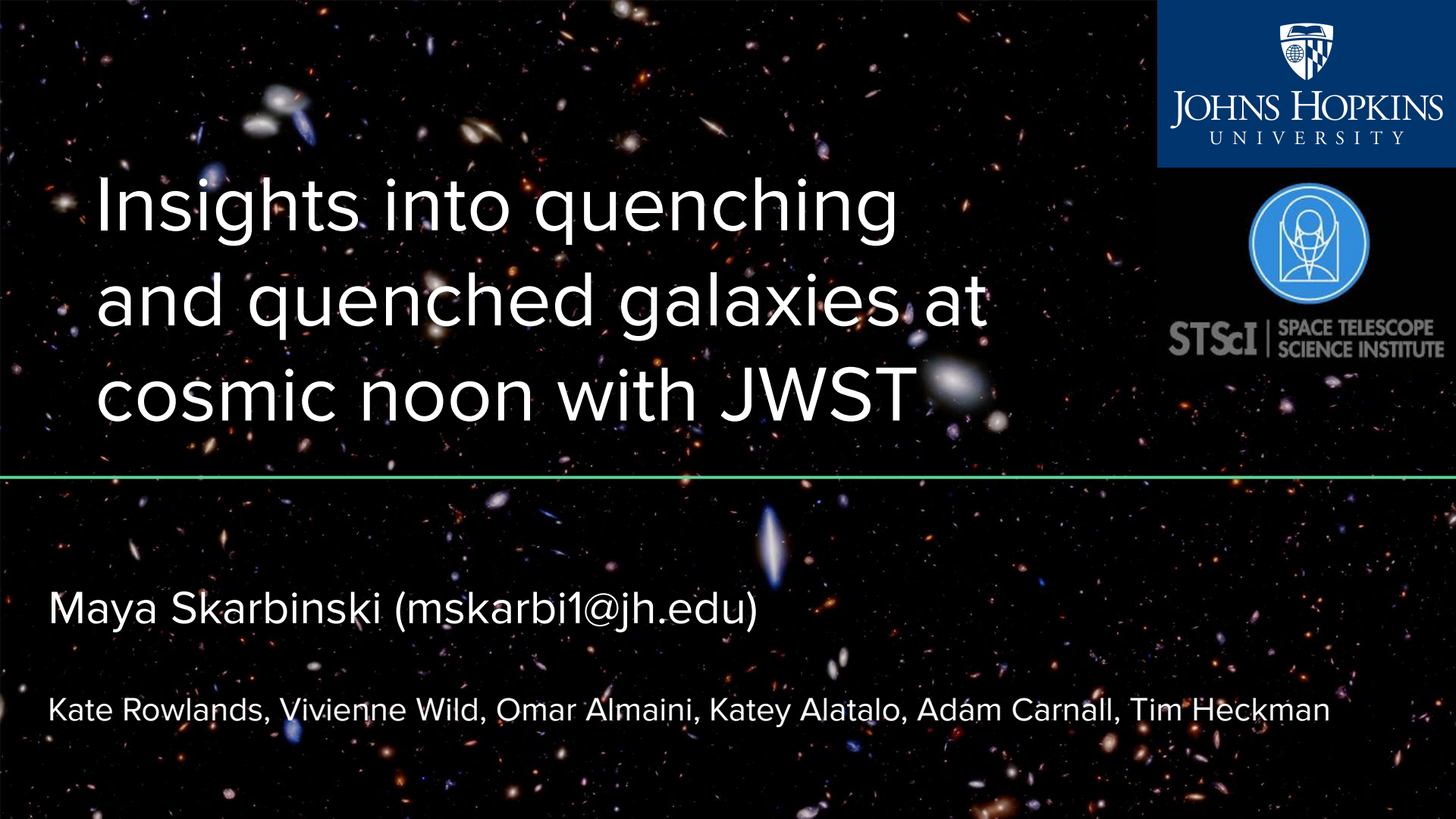

Insights into quenching and quenched galaxies at cosmic noon with JWST

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Kate Rowlands, Vivienne Wild, Omar Almaini, Katey Alatalo, Adam Carnall, Tim Heckman

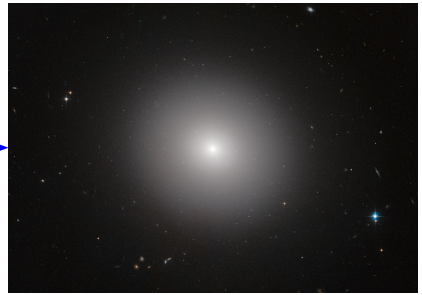
Post-starburst galaxies as tracers of quenching

- The majority of galaxies are either star-forming and spiral, or red and elliptical
- The process by which galaxies transition from star-forming to quiescent is known as “quenching”
- We can better understand quenching by studying galaxies in the act of transitioning

Star-forming galaxies

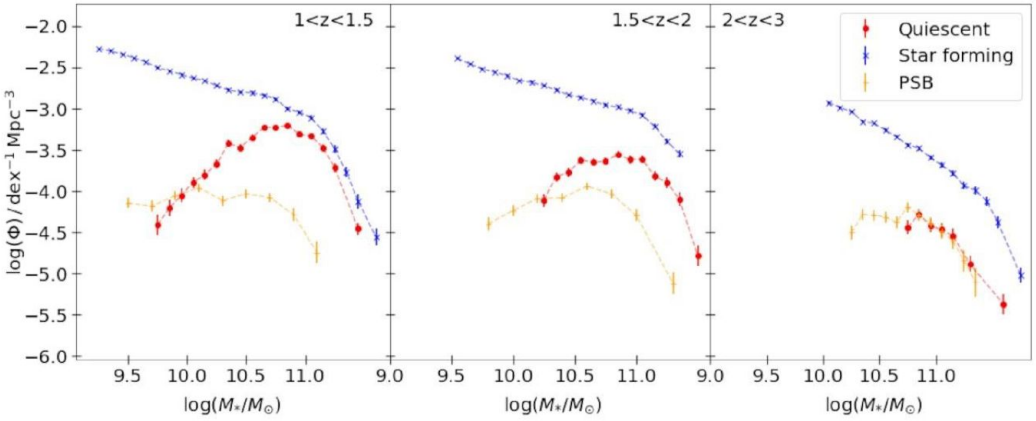
Post-starburst galaxies

Quiescent galaxies

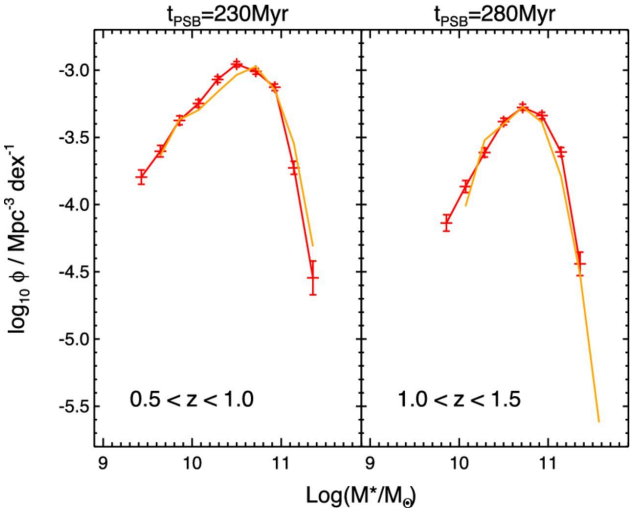


Post-starburst galaxies at cosmic noon

- Compact in size (e.g. Almaini+17)
- PSBs at z∼1 may account for 25-50% of the growth of the red sequence (Wild+20)



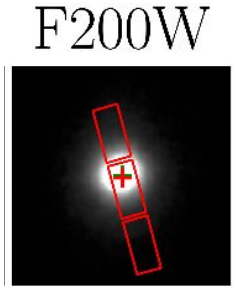
Taylor+23

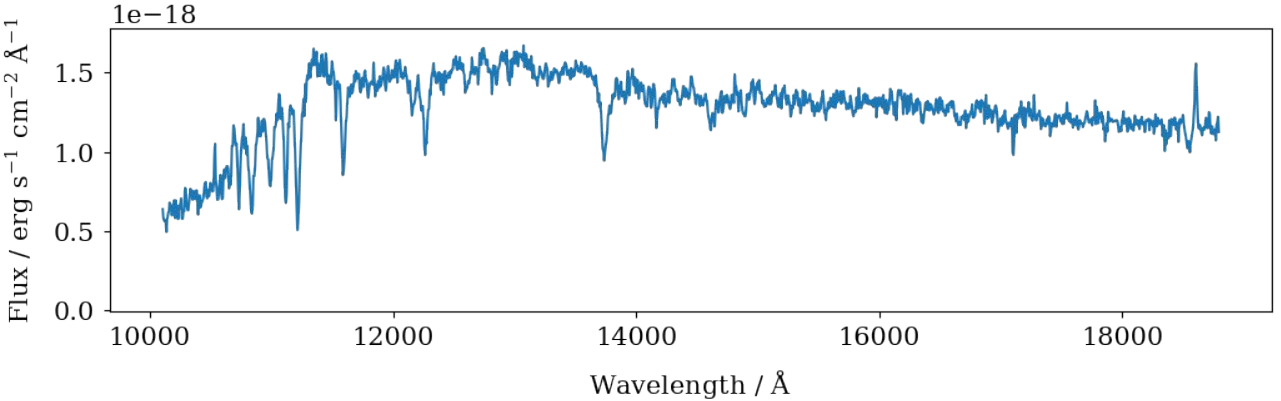


Wild+16

Early eXtragalactic Continuum and Emission Line Science (EXCELS) Survey

- We identified a sample of 30 post-starburst and quiescent galaxies between redshifts $1 < z < 4$
- With the advent of JWST, we are starting to get new insights into quenching at higher redshifts



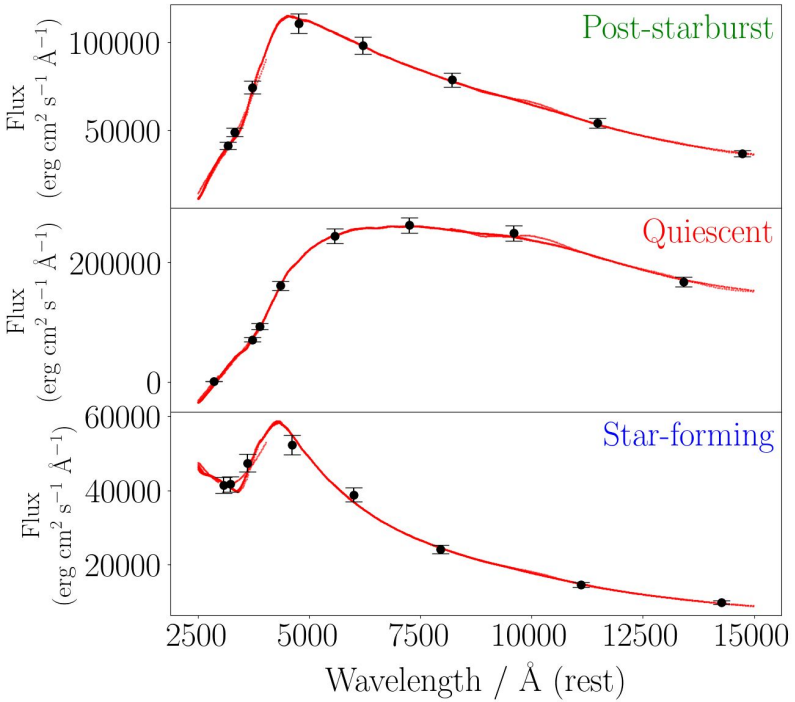


How to identify post-starburst galaxies photometrically

➔ Principal component analysis (PCA)

- Super-color 1: Made SED redder/bluer
- Super-color 2: Strength of 4000Å/Balmer break
- Super-color 3: Shape around 4000 Å

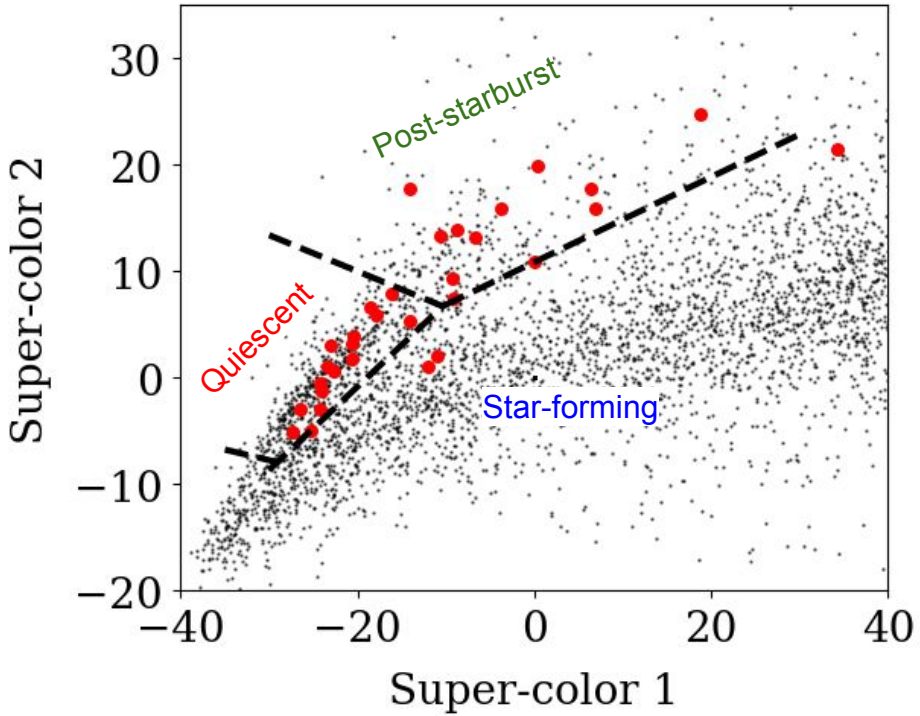
Following methodology of Wild+14,16



Principal Component Analysis (PCA) Classifications

PCA classifications from photometry agree with spectral classifications at redshifts $1 < z < 4$!

➜ First time this is being validated for $z > 1.4$



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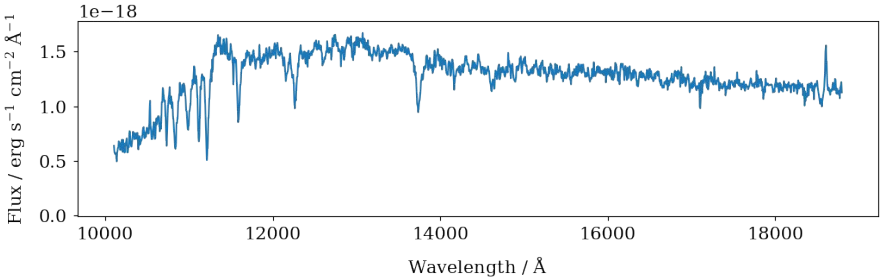
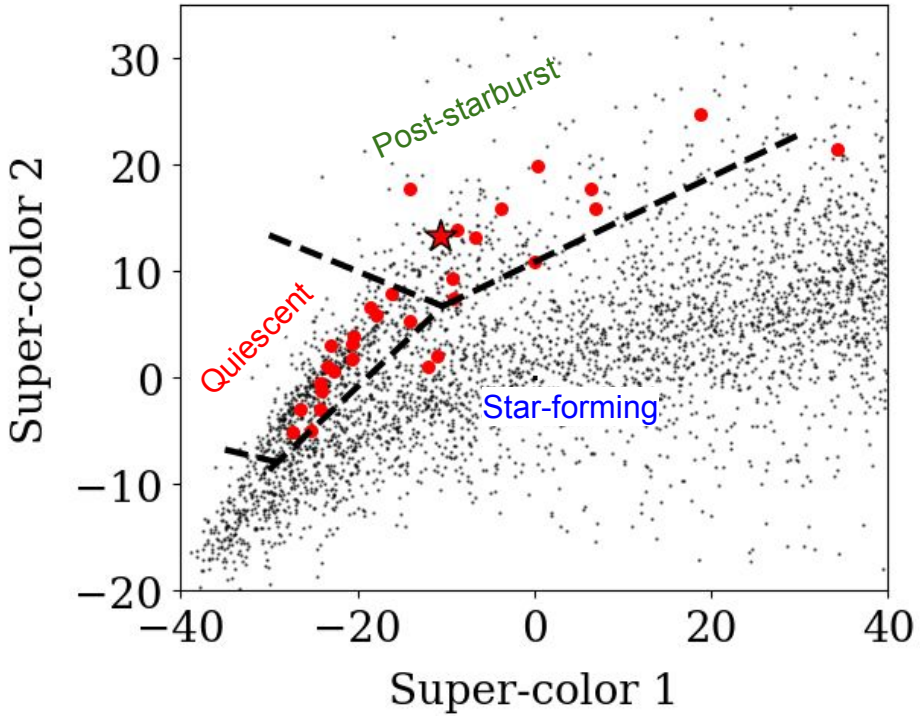
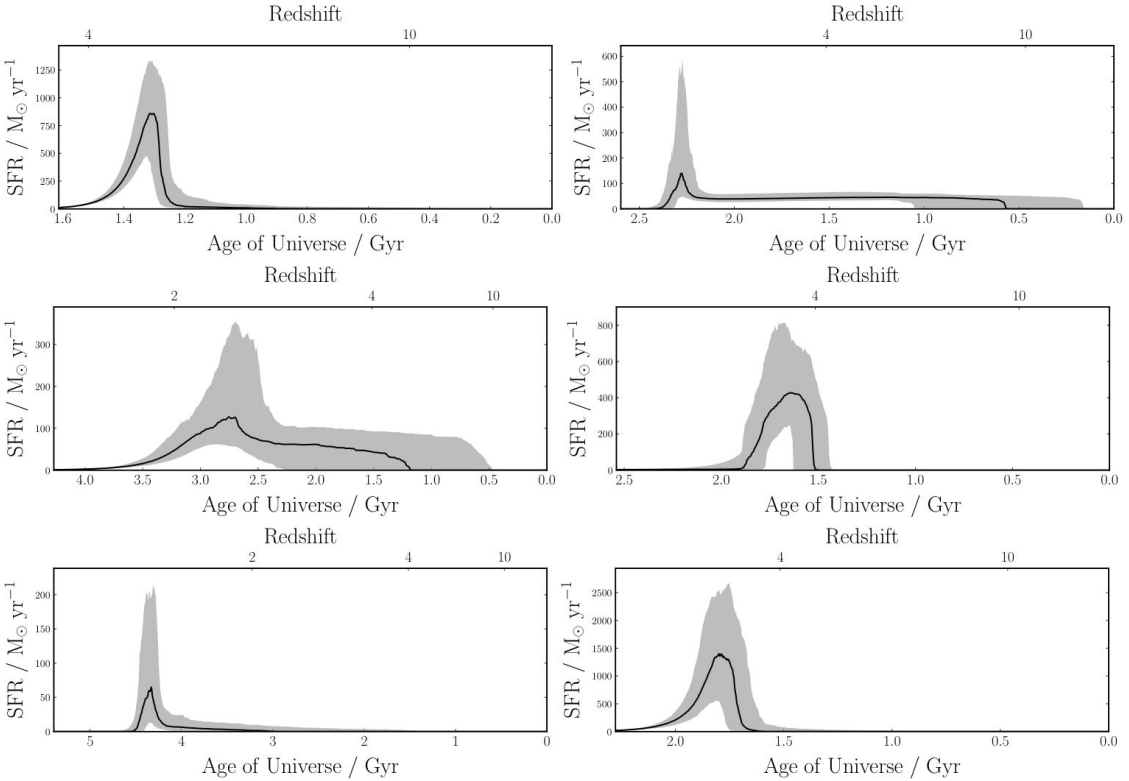




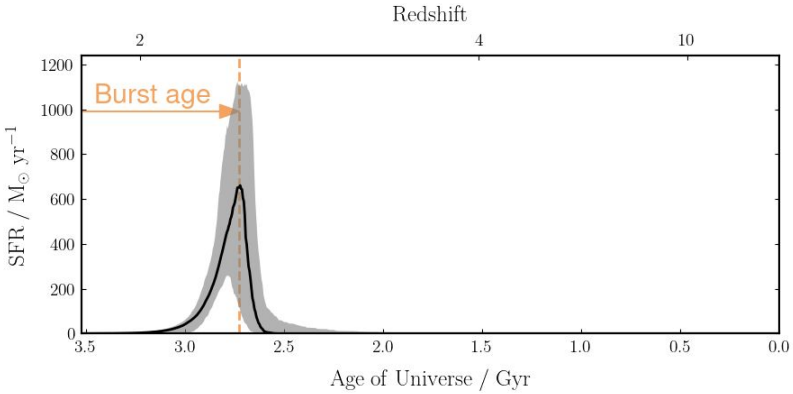
Star formation histories

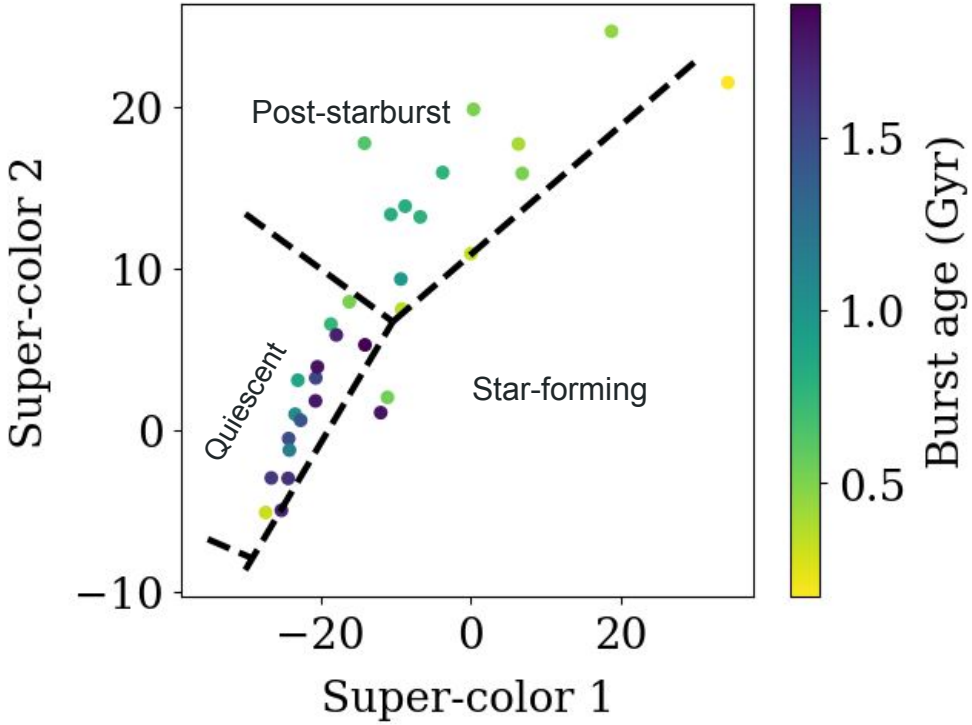
- Used Bagpipes to determine star formation histories of galaxies
- Seeing bursts of several 100 $M_{\odot} yr^{-1}$ followed by rapid quenching



Burst age

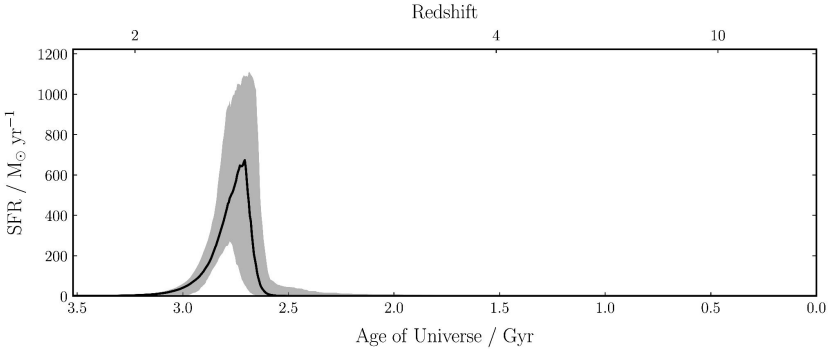
The burst ages of galaxies are correlated with their super-colors

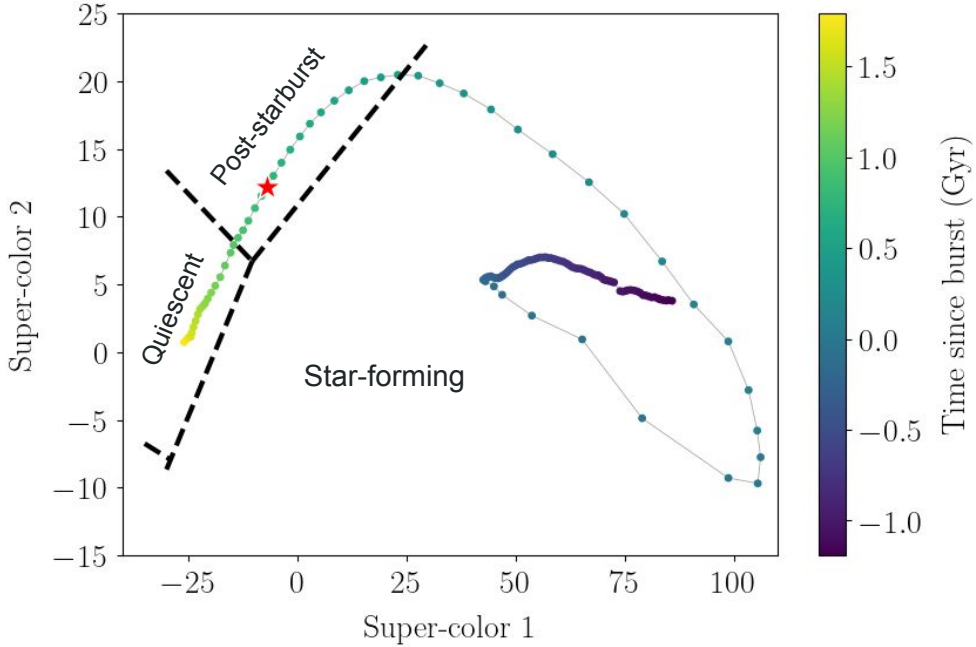




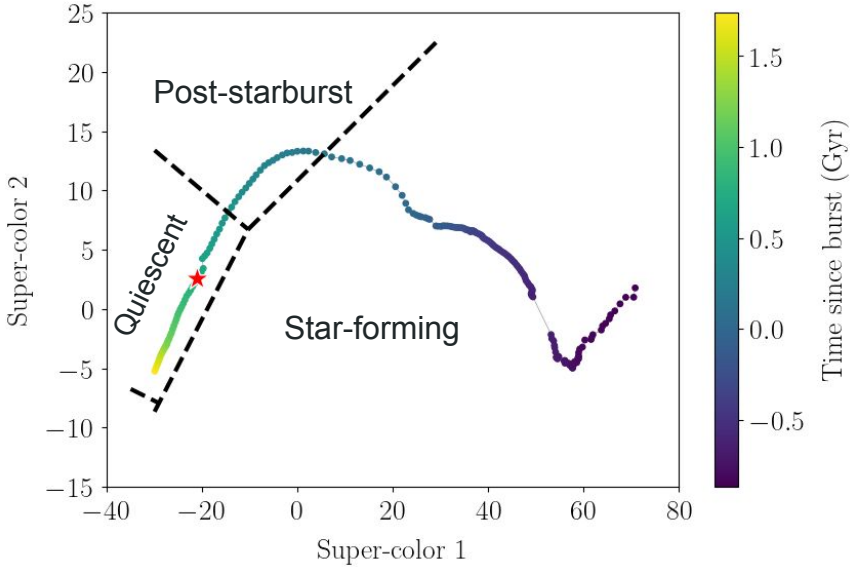
Super-color classifications over time

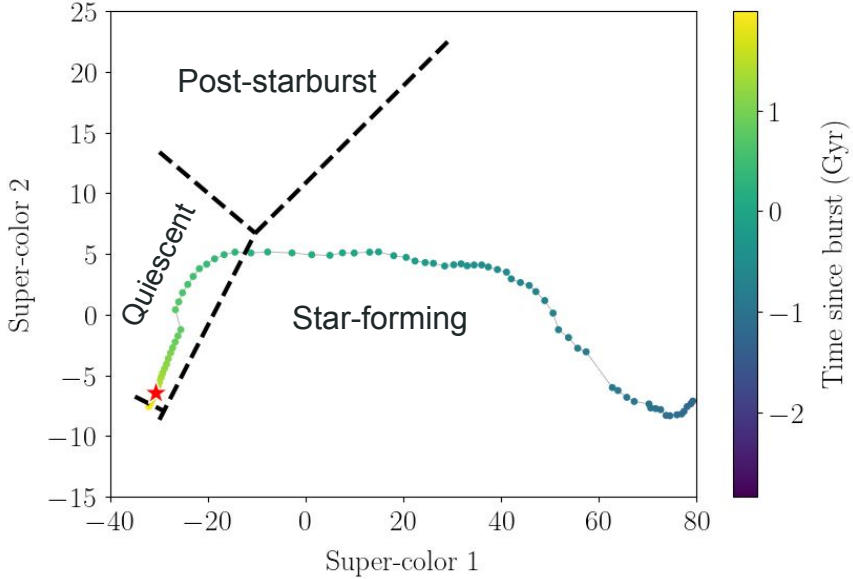
Using star formation histories, we can trace how galaxies' super-color classifications change over time





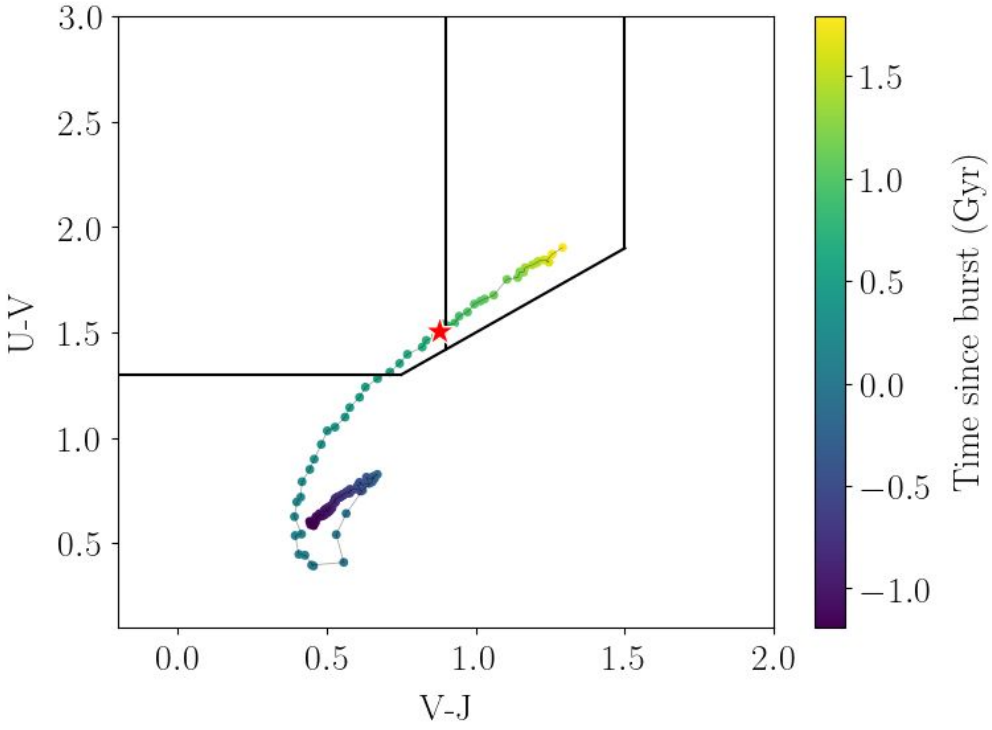
Super-color classifications over time





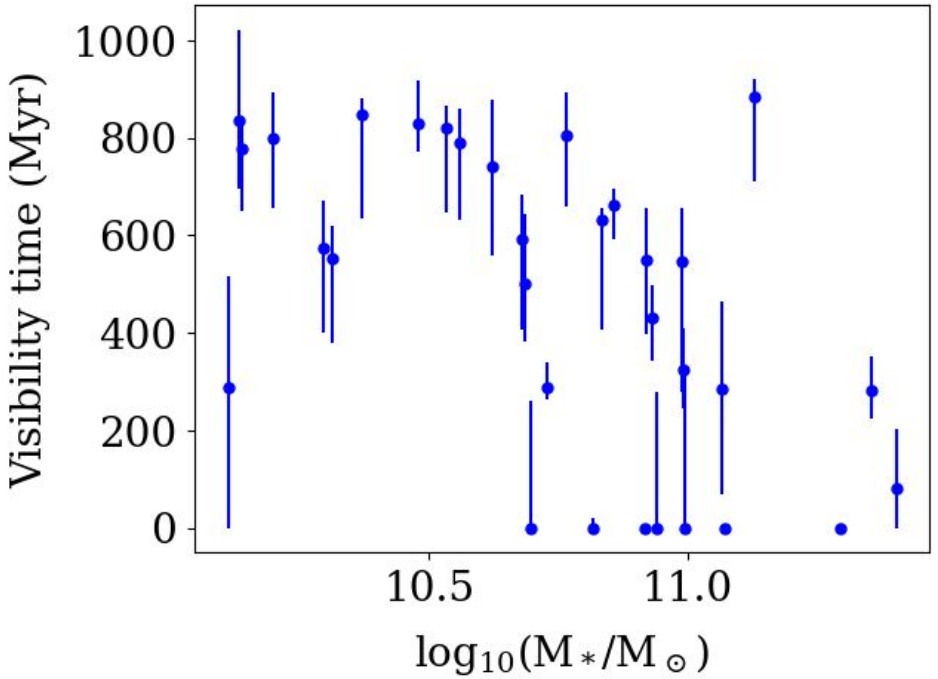
UVJ classifications over time

- UVJ diagrams are also often used to classify galaxies as star-forming or quiescent
- We can similarly trace galaxies' classifications through UVJ space
- This galaxy is currently in the post-starburst region, and we expect this galaxy to move into the quiescent region



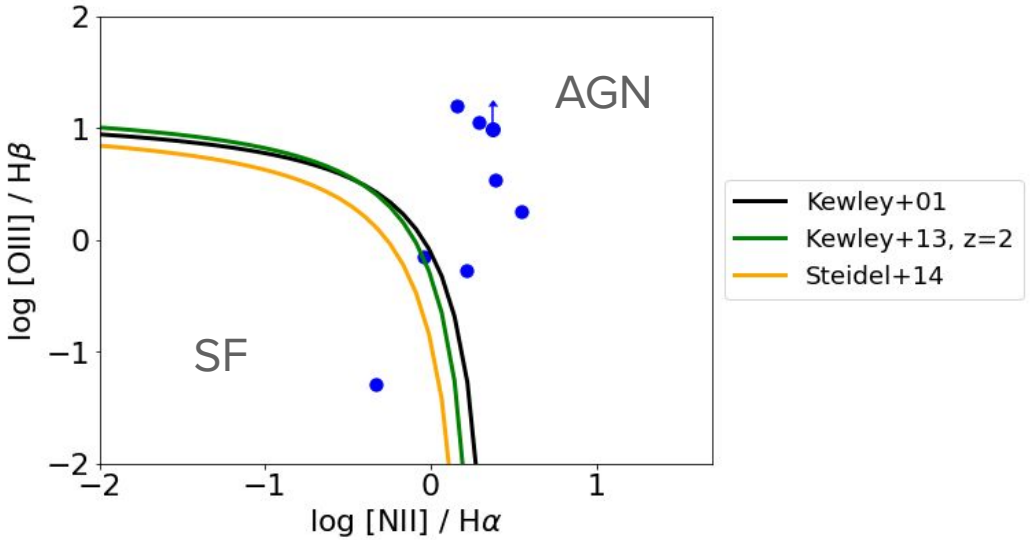
Post-starburst galaxy visibility times

- Using SFHs from Bagpipes, we can determine how long galaxies will be visible photometrically in the post-starburst region
- The median visibility time is 495 Myr
- Decrease in visibility time with stellar mass?
    - In agreement with De Lisle et al. (in prep)



AGN activity?

- Only 7/22 classified as an AGN using a BPT diagram and have EW(Hα) > 3Å
- The sources have no X-ray detections or radio detections



Conclusions

- Validated the super-color photometric selection method above $z > 1.4$ for the first time
- Super-colors are a good proxy for burst age of post-starburst and quiescent galaxies
- Post-starburst galaxies are visible for ~500 Myr
- The range of visibility times suggests different quenching mechanisms
- Evidence for AGN activity in 32% of post-starburst and quiescent galaxies based on BPT diagnostics

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